470049

FLOOD INSURANCE STUDY

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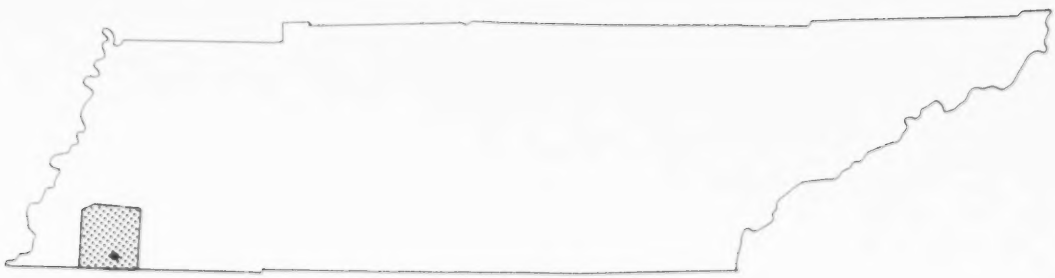

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Moscow, Fayette County, Tennessee, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Moscow to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, in cordination with the Soil Conservation Service, for the Federal Insurance Administration, under Interagency Agreement No. IAA-H-8-77, Project Order No. 15. This study was completed in February 1980.

1.3 Coordination

In January 1977 at a meeting attended by representatives of the FIA, Soil Conservation Service (SCS), U.S. Army Corps of Engineers (COE), and county and city officials; Wolf River and North Fork Wolf River were identified as possible flooding sources in Moscow and it was agreed that detailed studies would be conducted on these streams.

On July 17, 1980, the results of the study were reviewed at a final meeting attended by representatives of the study contractor and FIA, and community officials. The study was acceptable to the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Moscow, Tennessee. The area of study is shown on the Vicinity Map (Figure 1).

Portions of Wolf River and North Fork Wolf River in the vicinity of Moscow were studied in detail. It was found that no flooding occurs from the 500-year flood on the North Fork Wolf River within the corporate limits of Moscow.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through February 1985.

2.2 Community Description

The City of Moscow is located in the southwestern portion of Tennessee in the extreme southcentral section of Fayette County. It is situated about 40 miles east of Memphis, Tennessee, and approximately 4 miles north of the Tennessee-Mississippi state line.

The development in Moscow consists primarily of single family residences and a few private businesses. The majority of the development is located on a relatively high ridge between the Wolf River and North Fork Wolf River.

In 1970, according to U. S. Census Bureau, the population of Moscow was 448 (Reference 1).

The soils in the area are of the Grenada-Loring-Memphis Association. This association is predominantly undulating to rolling. It consists of broad ridges that are gently sloping with strongly sloping side slopes, and many small drainageways. The soils of this association formed in silt deposits ranging from 5 to more than 20 feet thick. Most of the area is well drained or moderately well drained.

The mean annual temperature in Moscow is 62 degrees F. January is the coldest month while July is the warmest month. The average rainfall in Moscow is about 50 inches.

2.3 Principal Flood Problems

The history of flooding on the Wolf River indicates that flooding may occur during any season of the year. The majority of floods, however, have occurred during the winter and spring. Runoff from intense rainfall is the principal cause of flooding in and around Moscow.

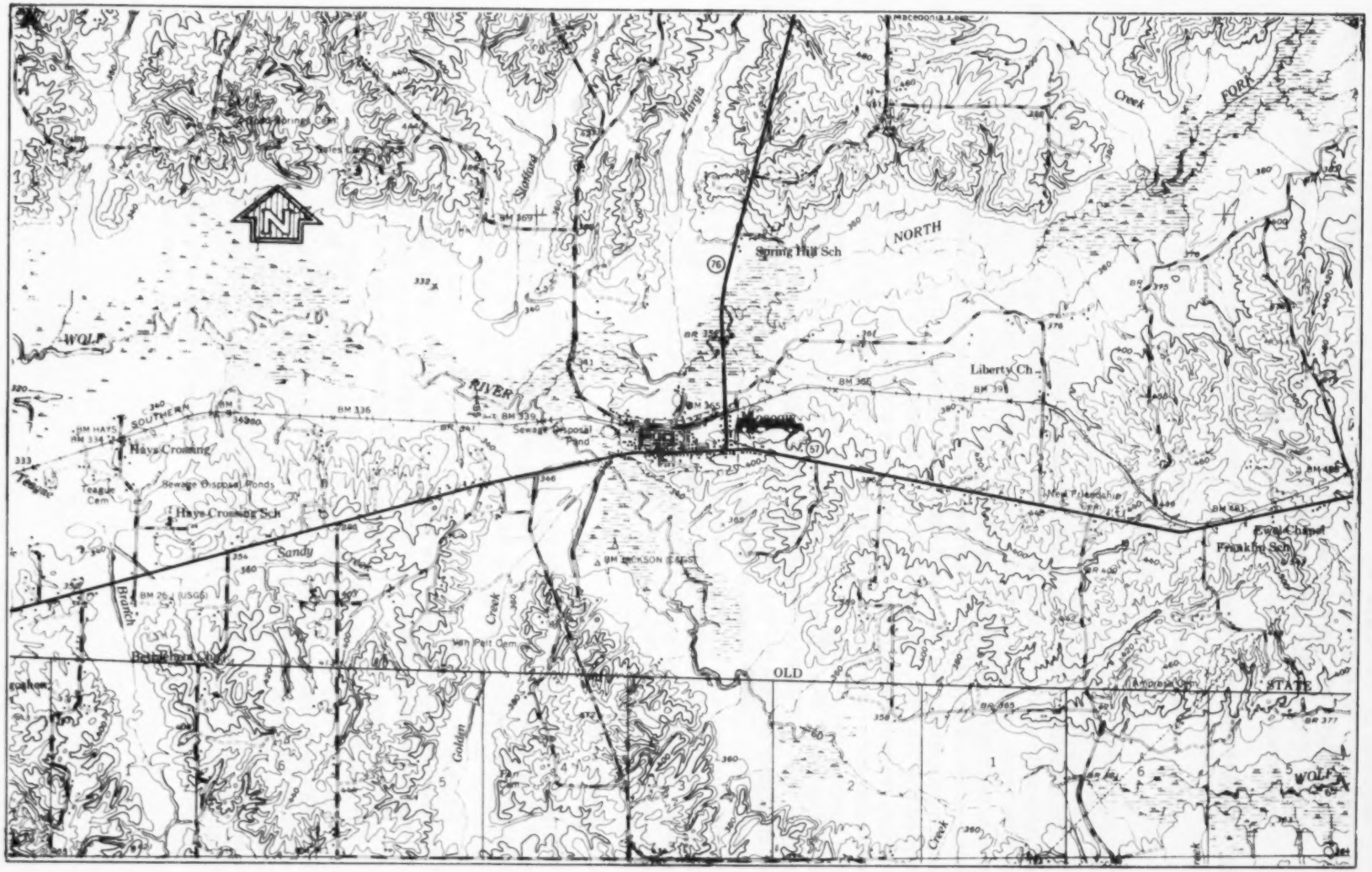


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF MOSCOW, TN
(FAYETTE CO.)

APPROXIMATE SCALE

1 0 1 2 3 MILES

VICINITY MAP

According to the U. S. Geological Survey (USGS), Water Division records obtained at the Rossville, Tennessee, gaging station between 1930 and 1972, the record flood on Wolf River occurred in 1935 with a peak discharge of 40,000 cubic feet per second. This flood was in excess of a 100-year flood. Floods also occurred along the Wolf River in 1946 and 1948 with frequencies of 35 and 7 years, respectively.

2.4 Flood Protection Measures

There are no flood protection measures for the City of Moscow, Tennessee.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Frequency-discharges were developed for the entire Wolf River Basin. The basin was divided into subareas, and unit hydrographs were developed using the SCS method as described in Soil Conservations Services' National Engineering Handbook (Reference 2). Rainfall frequency values were determined from National Weather Services Technical Paper No. 40 for the 10-, 50-, and 100-year frequency rainfalls (Reference 3). A corresponding 500-year frequency rainfall was determined by extrapolating the 10-, 50-, and 100-year frequency rainfall depths for given durations. Rainfall losses for each subarea were based on SCS land use and runoff curves. The rainfall excess was applied to each unit hydrograph to obtain the flood hydro-

graph for each area. The flood hydrographs were combined and routed by Modified Puls Method. The frequency-discharges were keyed to the USGS discharge gages at Rossville, Tennessee (established in 1929). Several major storms were reproduced for Rossville and Raleigh as a check for the HEC-1 model (Reference 4).

The peak discharge-drainage area relationships for the selected recurrence intervals are presented in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
WOLF RIVER					
Southern Railway*	295.6	12,320	18,390	21,040	27,990
State Highway 57*	295.7	12,320	18,390	21,040	27,990

*Outside corporate limits.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Aerial photographs of the Moscow area were flown in January 1976 (Reference 5). Cross section data and spot elevations within the flood plains were obtained by field surveys in August 1968, June 1976, and September 1977. All bridges and culverts were surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness coefficients (Manning's "n") were estimated by field inspection. The roughness coefficient averaged 0.050 for the main channel and 0.150 for the overbank areas.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Water-surface profiles were developed using computer program HEC-2, "Water-Surface Profiles" (Reference 6). This program uses the step-backwater standard method for computing water-surface elevations in natural channels. Starting water-surface elevations at the confluence of the Mississippi River were obtained from previous studies by the COE (Reference 7).

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown and described on the maps.

Flood elevations in the City of Moscow may be raised by debris blockage of the streams in the study area. The hydraulic analyses for this study were based on unobstructed flow. The flood elevations as shown on the profiles are thus considered valid only if hydraulic structures in general remain unobstructed and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps enlarged to a scale of 1:12,000 with a contour interval of ten feet. The topographic maps were made by transposing contour data from enlarged quadrangle maps (Reference 8) to an aeral photo-mosaic map (Reference 5). The contours were adjusted to agree with spot elevations and valley sections obtained in the field. In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities

are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown. The floodway of the Wolf River is outside of the corporate limits.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Wolf River*								
A	57.25	1,850	8,275	2.5	344.6	344.6	345.6	1.0
North Fork Wolf River*								
A	0.38	2,820	22,371	0.8	343.5	343.5	344.5	1.0
B	0.68	2,500	21,530	0.8	344.0	344.0	345.0	1.0
C	1.79	3,180	4,600	3.8	349.4	349.4	350.3	0.9

[1]Miles above confluence with Mississippi River for Wolf River; miles above mouth for North Fork Wolf River.
*Floodway lies outside corporate limits.

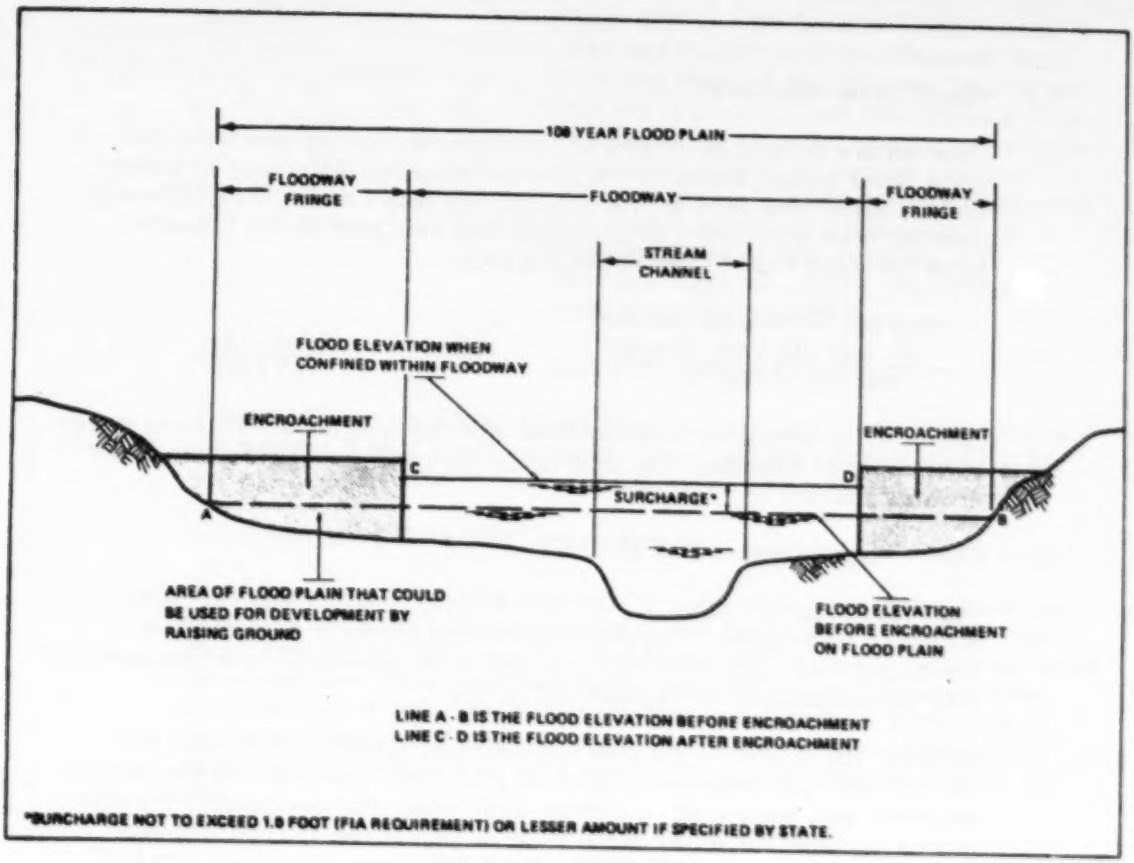
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF MOSCOW, TN
(FAYETTE CO.)

FLOODWAY DATA

WOLF RIVER-NORTH FORK WOLF RIVER


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE*
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the City of Moscow.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot

One reach meeting the above criteria was required for the flooding source of the City of Moscow. The location of the reach is shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of Moscow was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A4: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.

Zone B: Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Moscow is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

This Flood Insurance Study was made in conjunction with the Wolf River Basin Study. A Flood Hazard Boundary Map, dated May 1974, was prepared for the City of Moscow by the Department of Housing and Urban Development (Reference 9). Data presented here is in agreement with this previous determination and is authoritative for the purpose of the Flood Insurance Program.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 1375 Peachtree Street, N.E., Atlanta, Georgia 30309.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Wolf River Reach 1	0001	-1.9	-0.5	+1.5	020	A4	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF MOSCOW, TN
(FAYETTE CO.)

FLOOD INSURANCE ZONE DATA

WOLF RIVER

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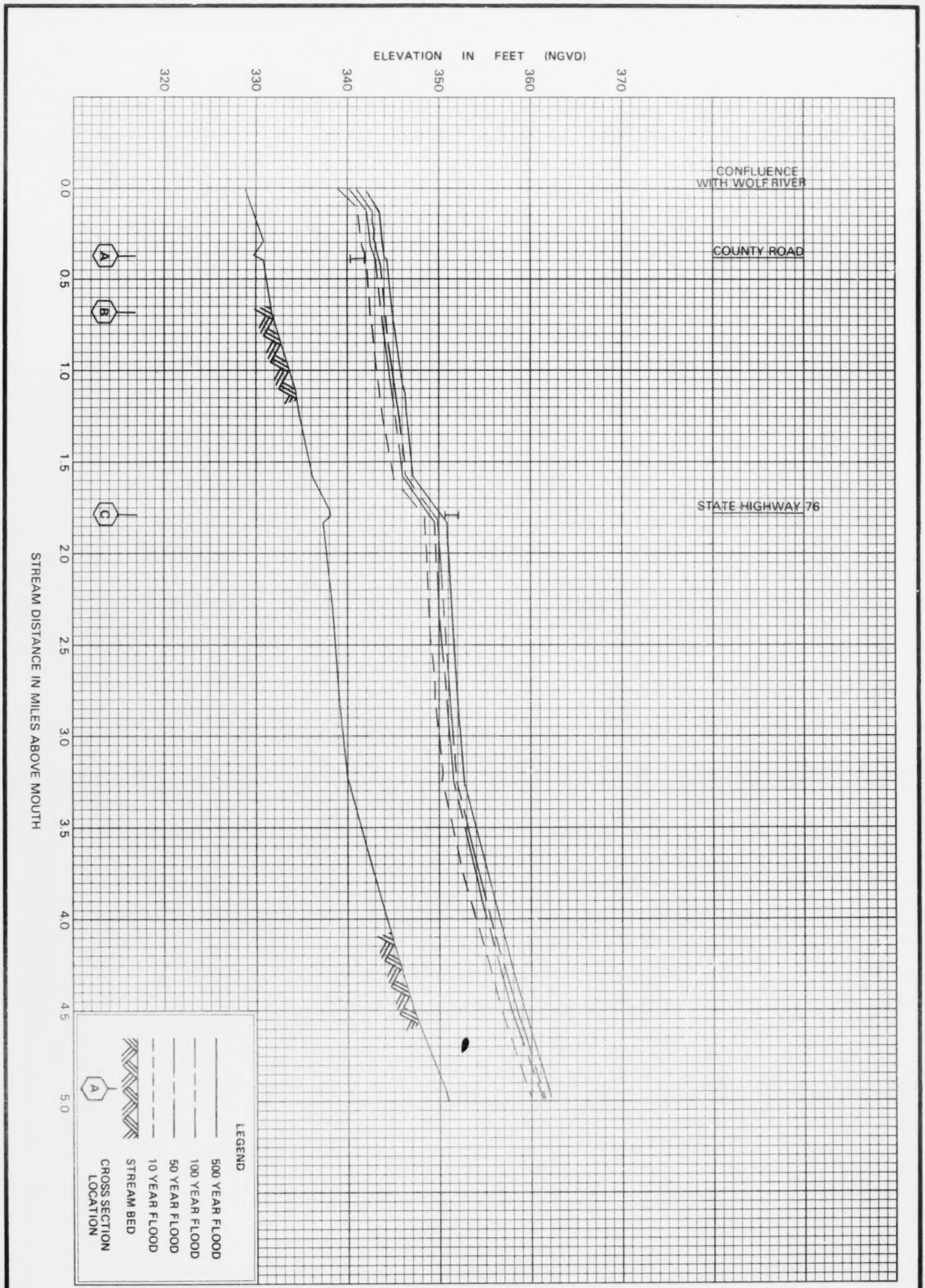

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FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF MOSCOW, TN
(FAYETTE CO.)

FLOOD PROFILES

NORTH FORK WOLF RIVER